FIG. 1

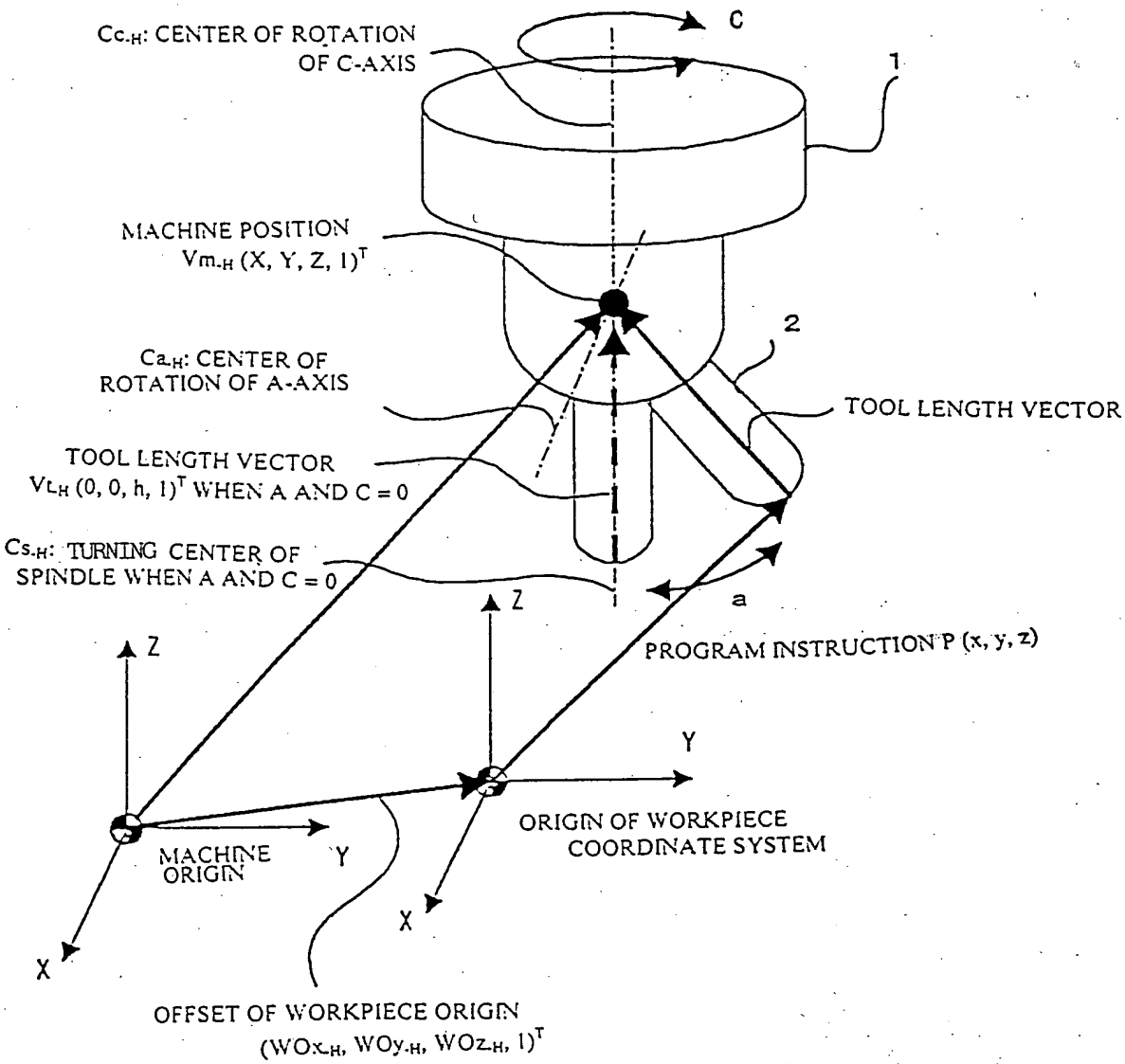

Cc.H: CENTER OF ROTATION OF C-AXIS
C
1
MACHINE POSITION Vm.H (X, Y, Z, 1)T
2
Ca.H: CENTER OF ROTATION OF A-AXIS
TOOL LENGTH VECTOR
TOOL LENGTH VECTOR VL.H (0, 0, h, 1)T WHEN A AND C = 0
Cs.H: TURNING CENTER OF SPINDLE WHEN A AND C = 0
a
Z
PROGRAM INSTRUCTION P (x, y, z)
Z
Y
ORIGIN OF WORKPIECE COORDINATE SYSTEM
MACHINE ORIGIN
Y
X
X
OFFSET OF WORKPIECE ORIGIN (WOx.H, WOy.H, WOz.H, 1)T

FIG. 2

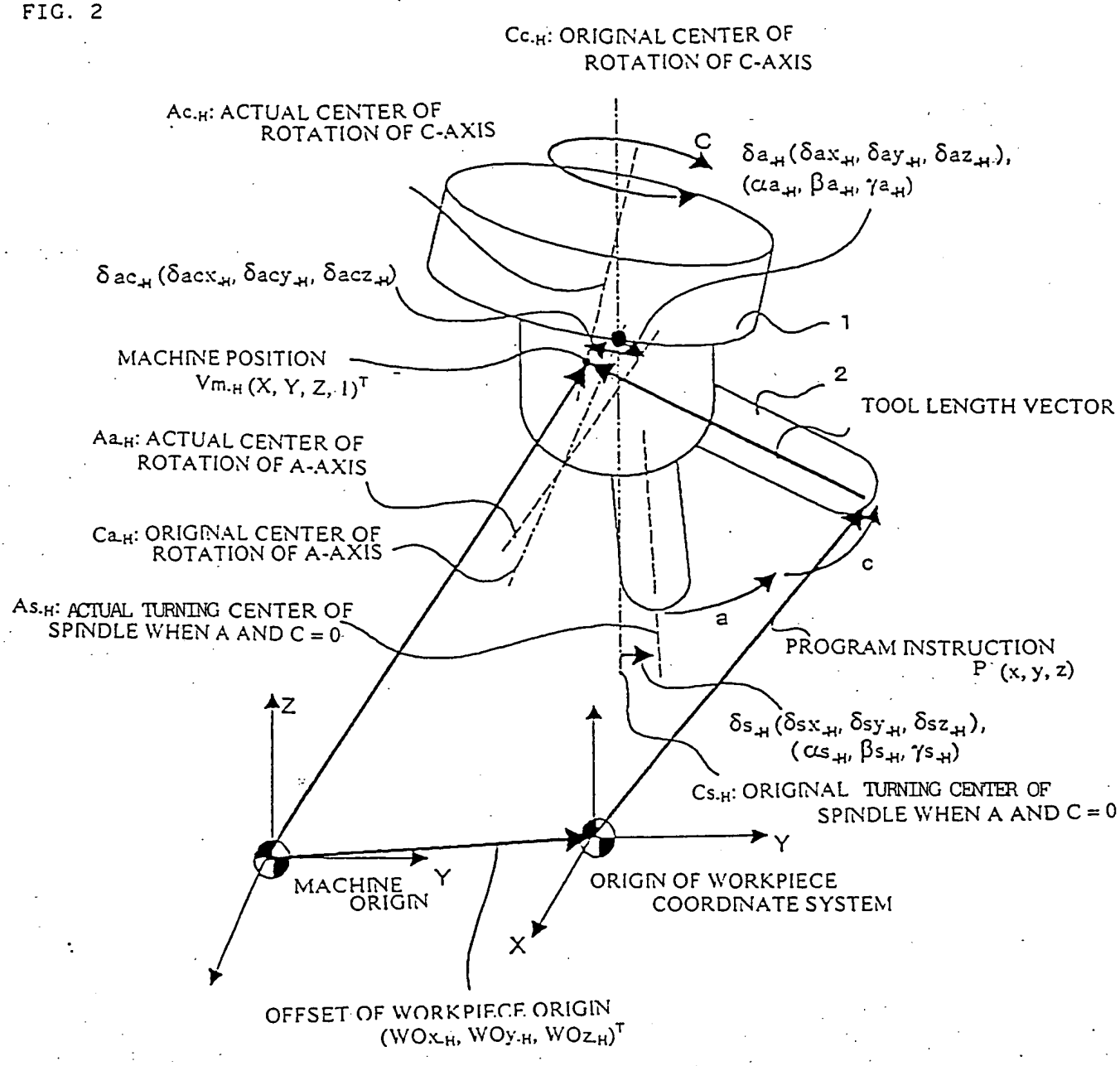

Cc-H: ORIGINAL CENTER OF ROTATION OF C-AXIS
Ac-H: ACTUAL CENTER OF ROTATION OF C-AXIS
C
δa-H (δax-H, δay-H, δaz-H),
(αa-H, βa-H, γa-H)
δac-H (δacx-H, δacy-H, δacz-H)
1
MACHINE POSITION
Vm-H (X, Y, Z, 1)T
2
TOOL LENGTH VECTOR
Aa-H: ACTUAL CENTER OF ROTATION OF A-AXIS
Ca-H: ORIGINAL CENTER OF ROTATION OF A-AXIS
c
As-H: ACTUAL TURNING CENTER OF SPINDLE WHEN A AND C = 0
a
PROGRAM INSTRUCTION
P (x, y, z)
δs-H (δsx-H, δsy-H, δsz-H),
(αs-H, βs-H, γs-H)
Cs-H: ORIGINAL TURNING CENTER OF SPINDLE WHEN A AND C = 0
Z
Y
MACHINE ORIGIN
Y
ORIGIN OF WORKPIECE COORDINATE SYSTEM
X
OFFSET OF WORKPIECE ORIGIN
(WOx-H, WOy-H, WOz-H)T

FIG. 3

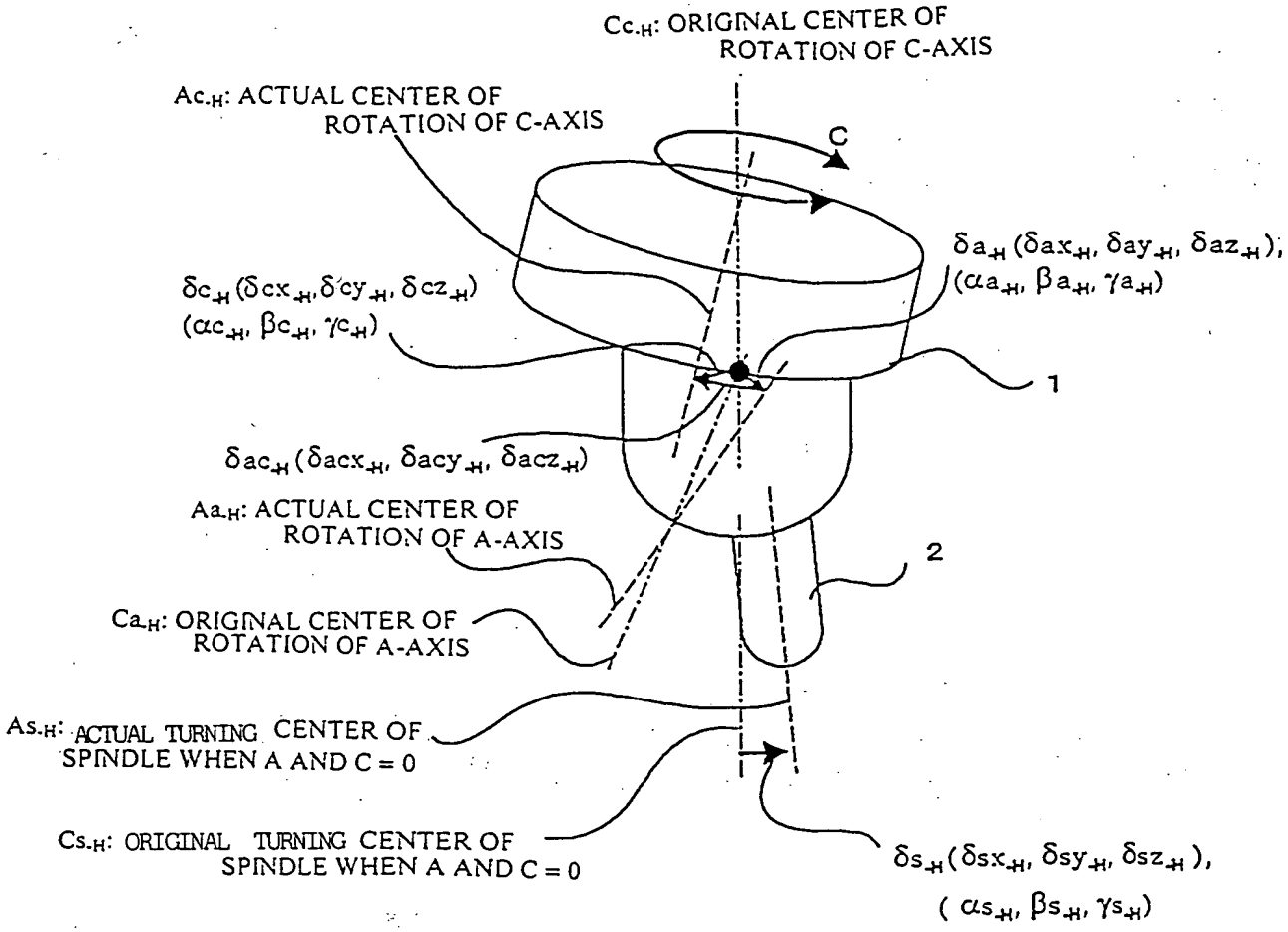

Cc.H: ORIGINAL CENTER OF ROTATION OF C-AXIS
Ac.H: ACTUAL CENTER OF ROTATION OF C-AXIS
C
δa.H (δax.H, δay.H, δaz.H), (αa.H, βa.H, γa.H)
δc.H (δcx.H, δcy.H, δcz.H) (αc.H, βc.H, γc.H)
1
δac.H (δacx.H, δacy.H, δacz.H)
Aa.H: ACTUAL CENTER OF ROTATION OF A-AXIS
2
Ca.H: ORIGINAL CENTER OF ROTATION OF A-AXIS
As.H: ACTUAL TURNING CENTER OF SPINDLE WHEN A AND C = 0
Cs.H: ORIGINAL TURNING CENTER OF SPINDLE WHEN A AND C = 0
δs.H (δsx.H, δsy.H, δsz.H), (αs.H, βs.H, γs.H)

FIG. 4

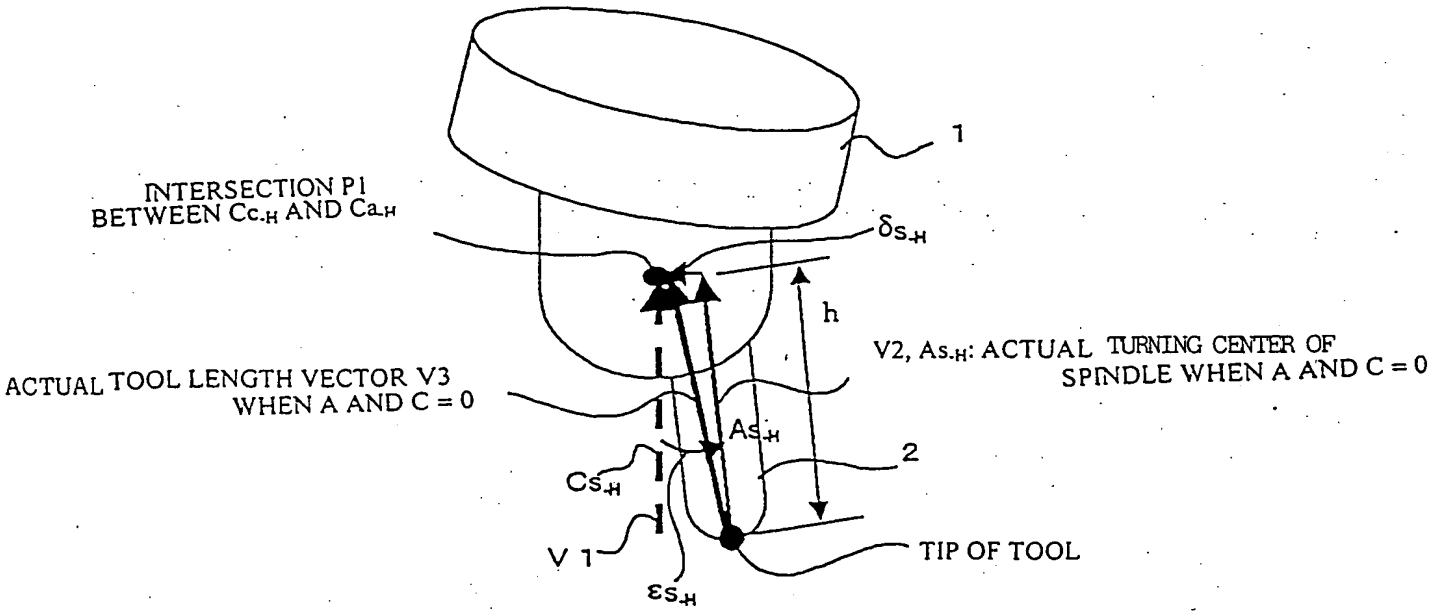

1
INTERSECTION P1 BETWEEN Cc.H AND Ca.H
δs.H
h
V2, As.H: ACTUAL TURNING CENTER OF SPINDLE WHEN A AND C = 0
ACTUAL TOOL LENGTH VECTOR V3 WHEN A AND C = 0
As.H
2
Cs.H
V 1
TIP OF TOOL
εs.H

FIG. 5

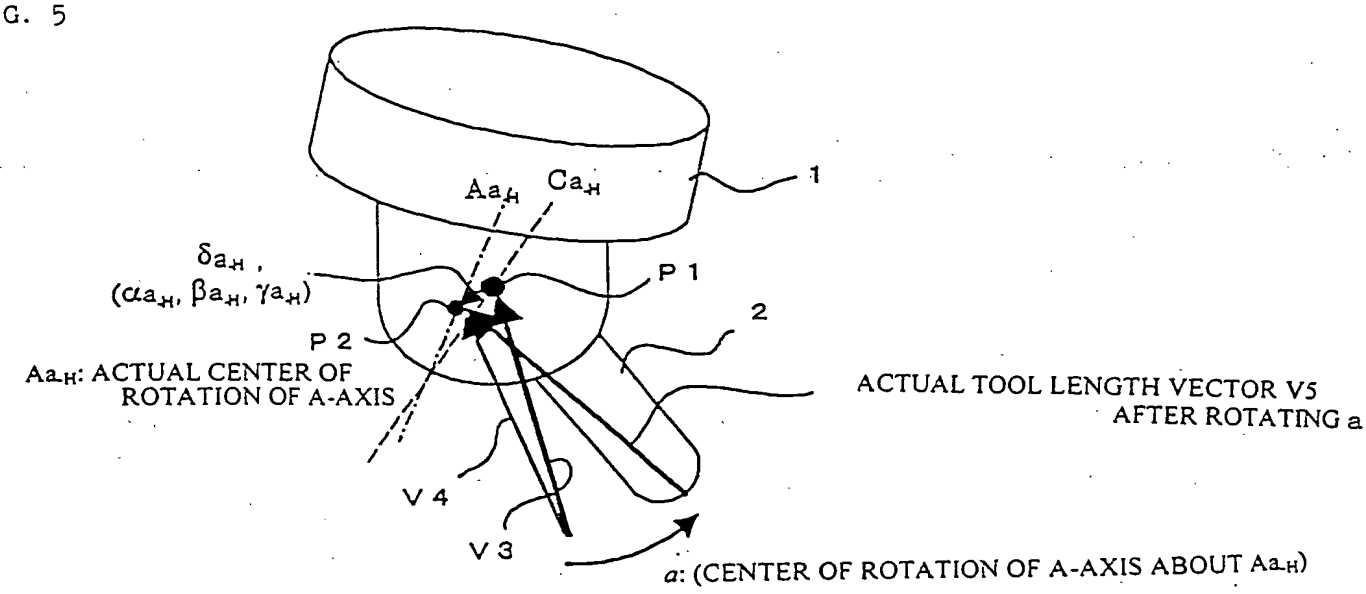

Aa_H
Ca_H
1
δa_H ,
(αa_H, βa_H, γa_H)
P 1
2
P 2
Aa_H: ACTUAL CENTER OF ROTATION OF A-AXIS
ACTUAL TOOL LENGTH VECTOR V5 AFTER ROTATING a
V 4
V 3
a: (CENTER OF ROTATION OF A-AXIS ABOUT Aa_H)

FIG. 6

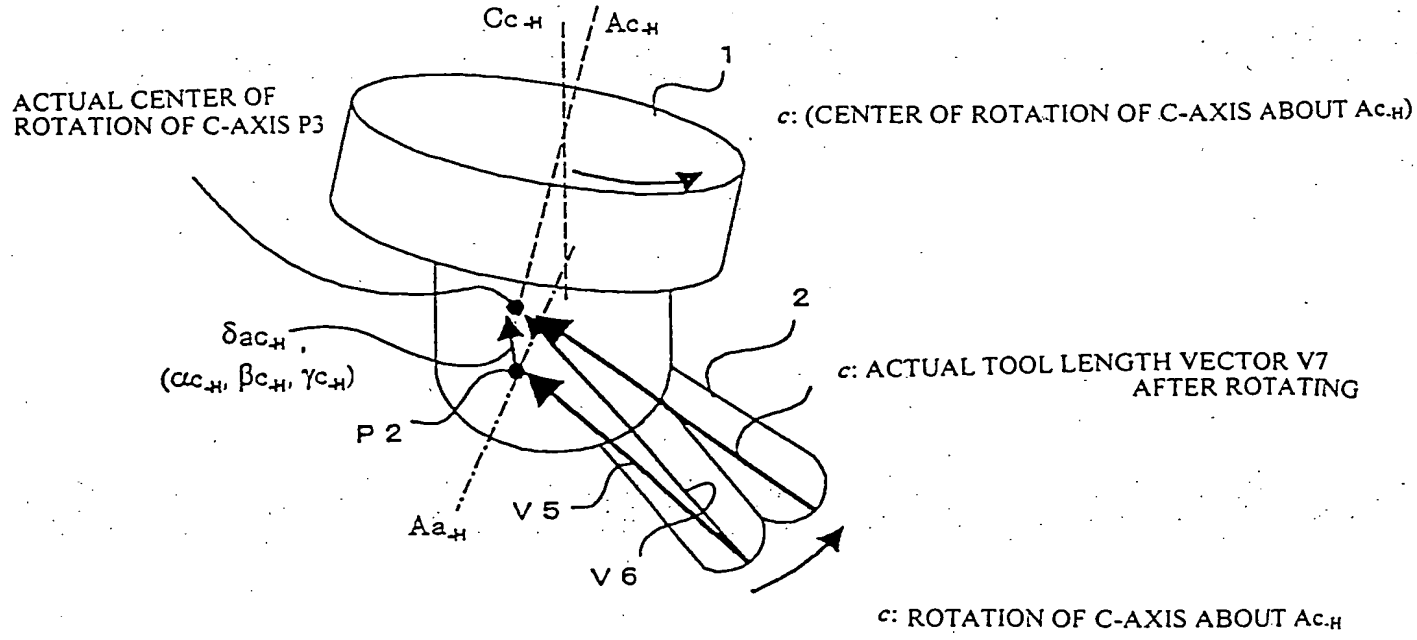

Cc_H
Ac_H
1
ACTUAL CENTER OF ROTATION OF C-AXIS P3
c: (CENTER OF ROTATION OF C-AXIS ABOUT Ac_H)
2
δac_H ,
(αc_H, βc_H, γc_H)
c: ACTUAL TOOL LENGTH VECTOR V7 AFTER ROTATING
P 2
Aa_H
V 5
V 6
c: ROTATION OF C-AXIS ABOUT Ac_H

FIG. 7

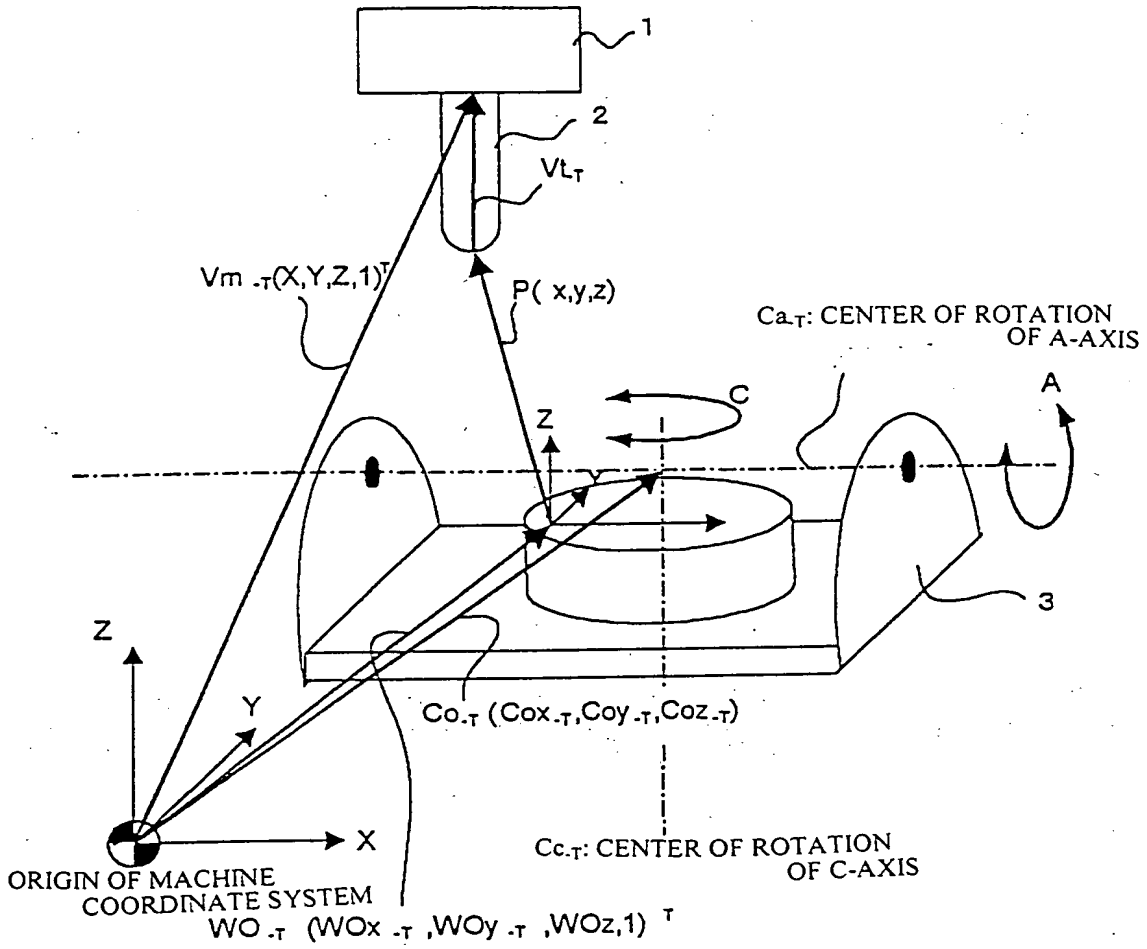

1
2
Vt_T
Vm_T(X,Y,Z,1)^T
P(x,y,z)
Ca_T: CENTER OF ROTATION OF A-AXIS
C
A
Z
Y
3
Z
Y
X
Co_T (Cox_T,Coy_T,Coz_T)
Cc_T: CENTER OF ROTATION OF C-AXIS
ORIGIN OF MACHINE COORDINATE SYSTEM
WO_T (WOx_T ,WOy_T ,WOz,1)^T

FIG. 8

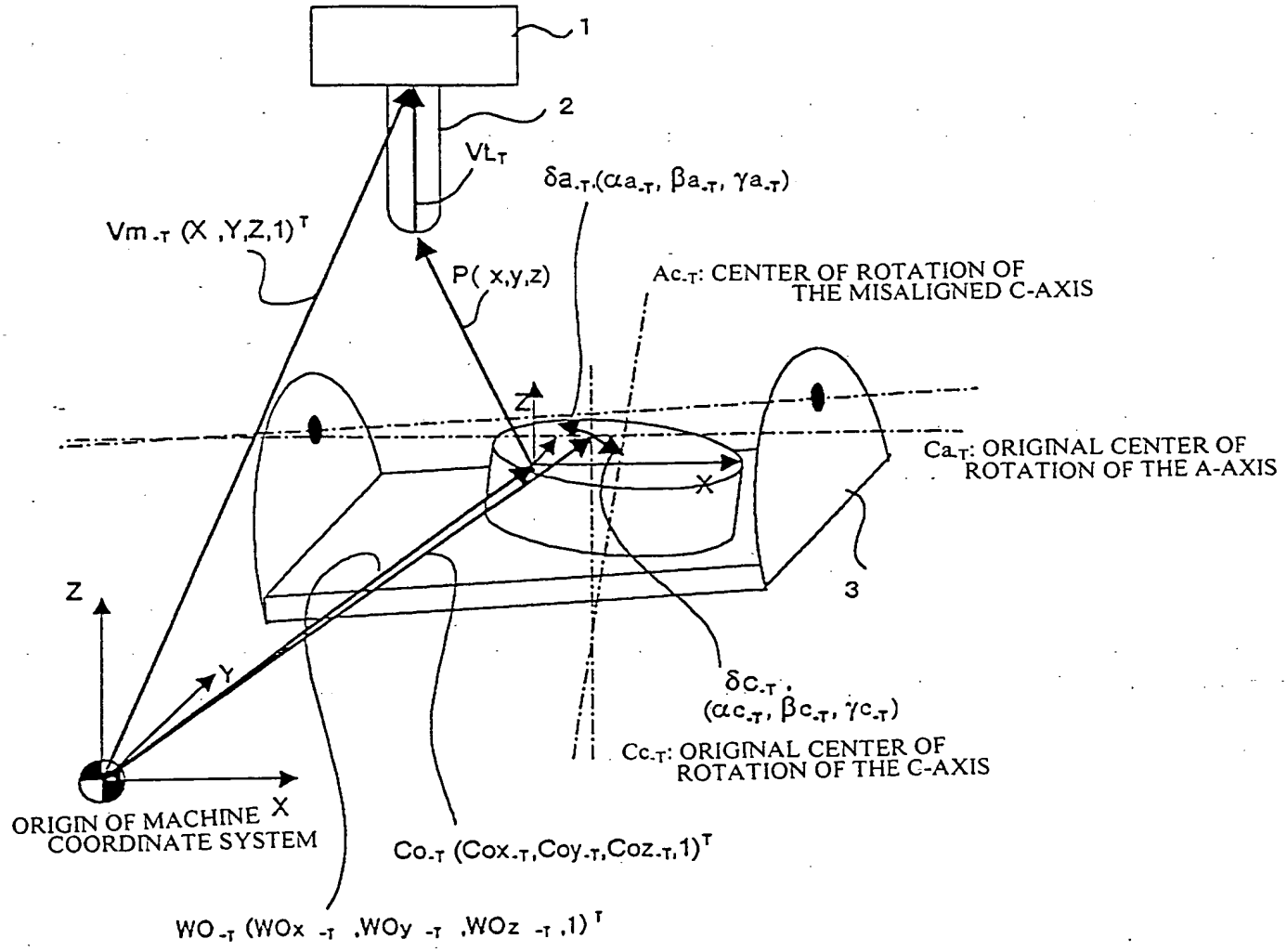

1
2
Vt_T
$\delta a_{-T}(\alpha a_{-T}, \beta a_{-T}, \gamma a_{-T})$
$Vm_{-T}(X, Y, Z, 1)^T$
$P(x, y, z)$
Ac_{-T}: CENTER OF ROTATION OF THE MISALIGNED C-AXIS
Ca_{-T}: ORIGINAL CENTER OF ROTATION OF THE A-AXIS
3
δc_{-T} . $(\alpha c_{-T}, \beta c_{-T}, \gamma c_{-T})$
Cc_{-T}: ORIGINAL CENTER OF ROTATION OF THE C-AXIS
Z
Y
X
ORIGIN OF MACHINE COORDINATE SYSTEM
$Co_{-T}(Cox_{-T}, Coy_{-T}, Coz_{-T}, 1)^T$
$WO_{-T}(WOx_{-T}, WOy_{-T}, WOz_{-T}, 1)^T$

FIG. 9

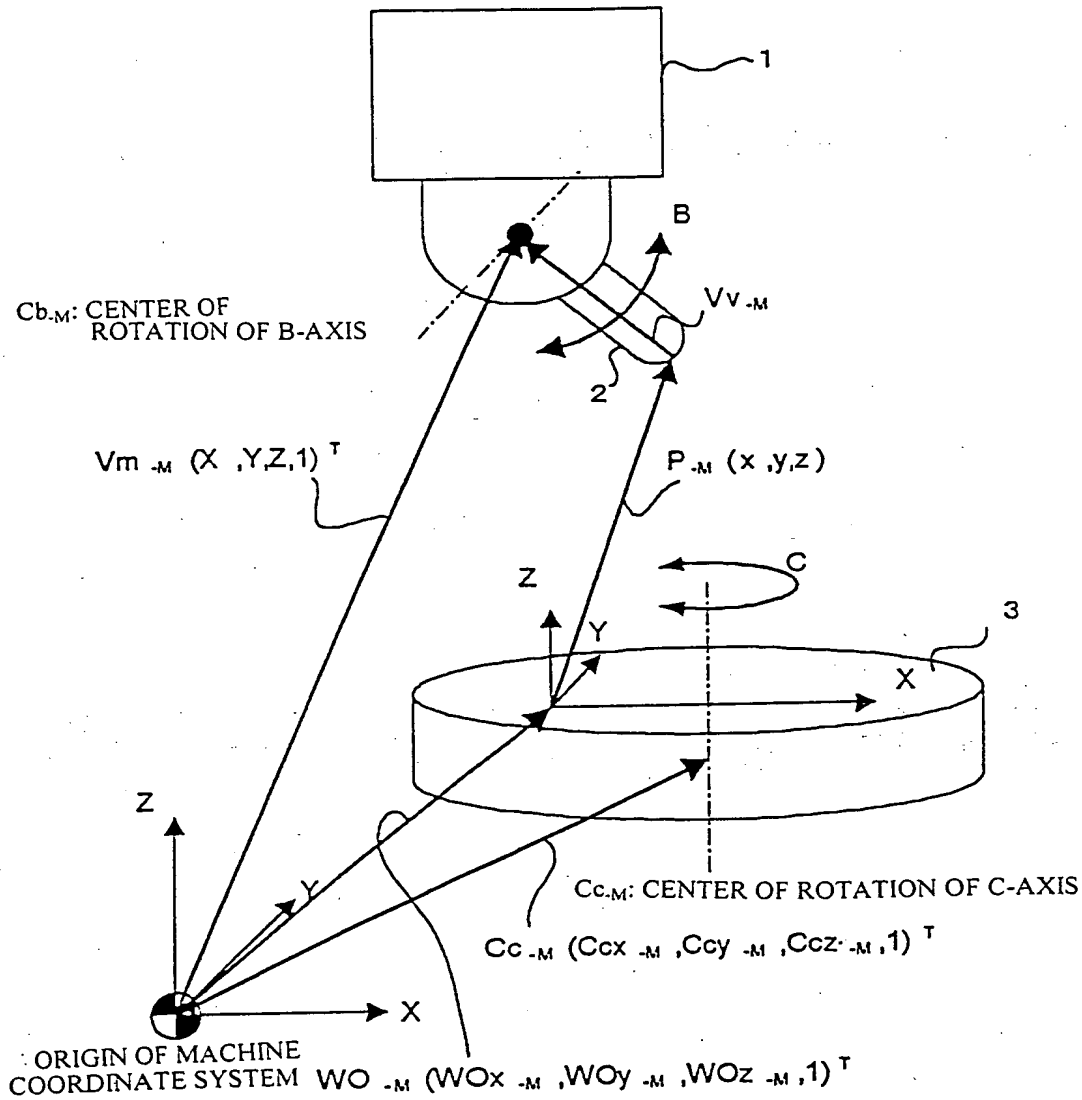

1
B
Vv -M
2
Cb-M: CENTER OF ROTATION OF B-AXIS
Vm -M (X ,Y,Z,1) T
P -M (x ,y,z)
Z
C
Y
3
X
Z
Y
X
Cc-M: CENTER OF ROTATION OF C-AXIS
Cc -M (Ccx -M ,Ccy -M ,Ccz -M ,1) T
ORIGIN OF MACHINE COORDINATE SYSTEM
WO -M (WOx -M ,WOy -M ,WOz -M ,1) T

FIG. 10

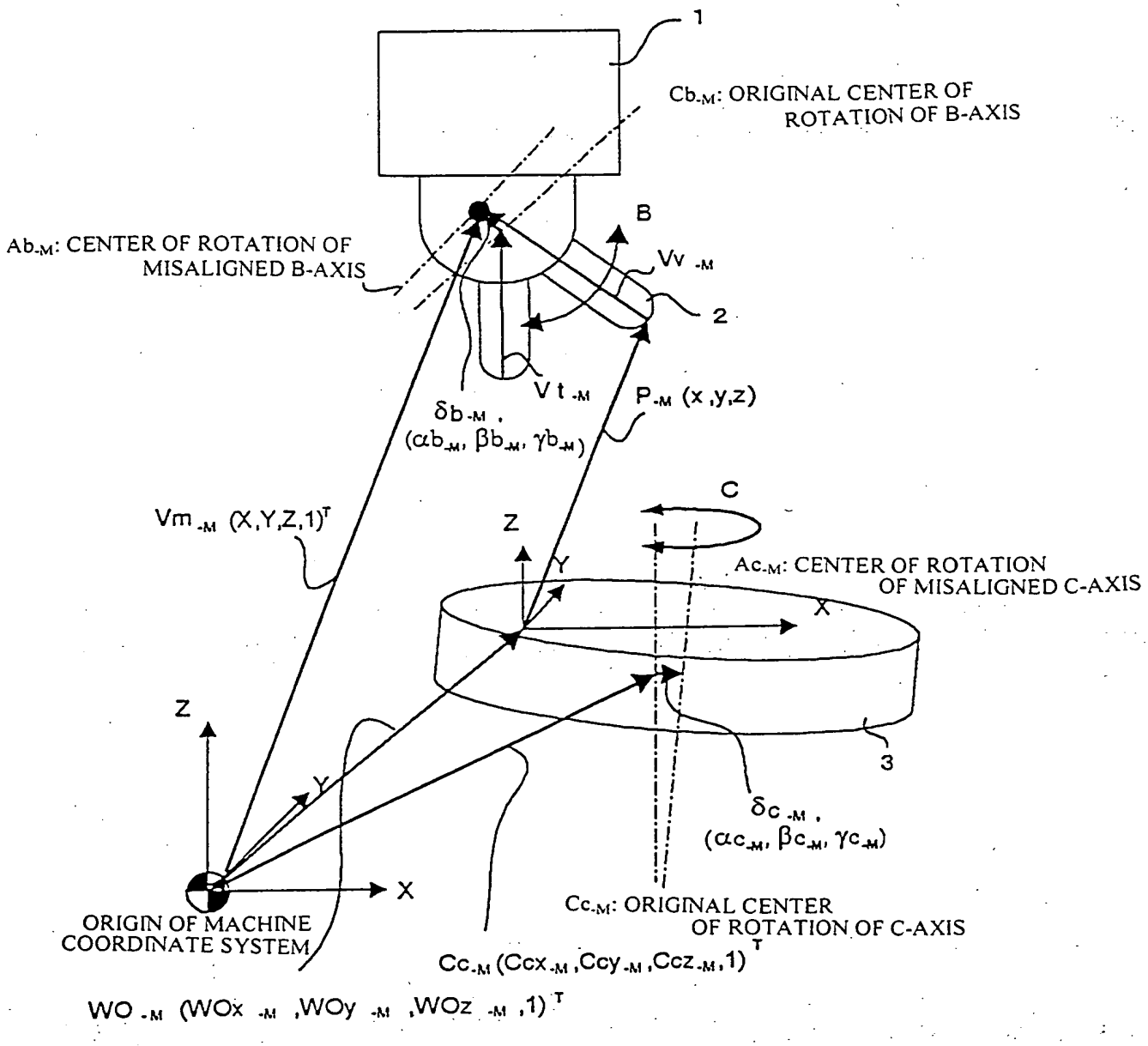

1
Cb-M: ORIGINAL CENTER OF ROTATION OF B-AXIS
Ab-M: CENTER OF ROTATION OF MISALIGNED B-AXIS
B
Vv -M
2
Vt -M
δb -M ,
(αb-M, βb-M, γb-M)
P-M (x ,y,z)
C
Vm -M (X,Y,Z,1)T
Z
Y
Ac-M: CENTER OF ROTATION OF MISALIGNED C-AXIS
X
Z
Y
3
δc -M ,
(αc-M, βc-M, γc-M)
X
ORIGIN OF MACHINE COORDINATE SYSTEM
Cc-M: ORIGINAL CENTER OF ROTATION OF C-AXIS
Cc-M (Ccx-M ,Ccy-M ,Ccz-M ,1)T
WO -M (WOx -M ,WOy -M ,WOz -M ,1) T

FIG. 11

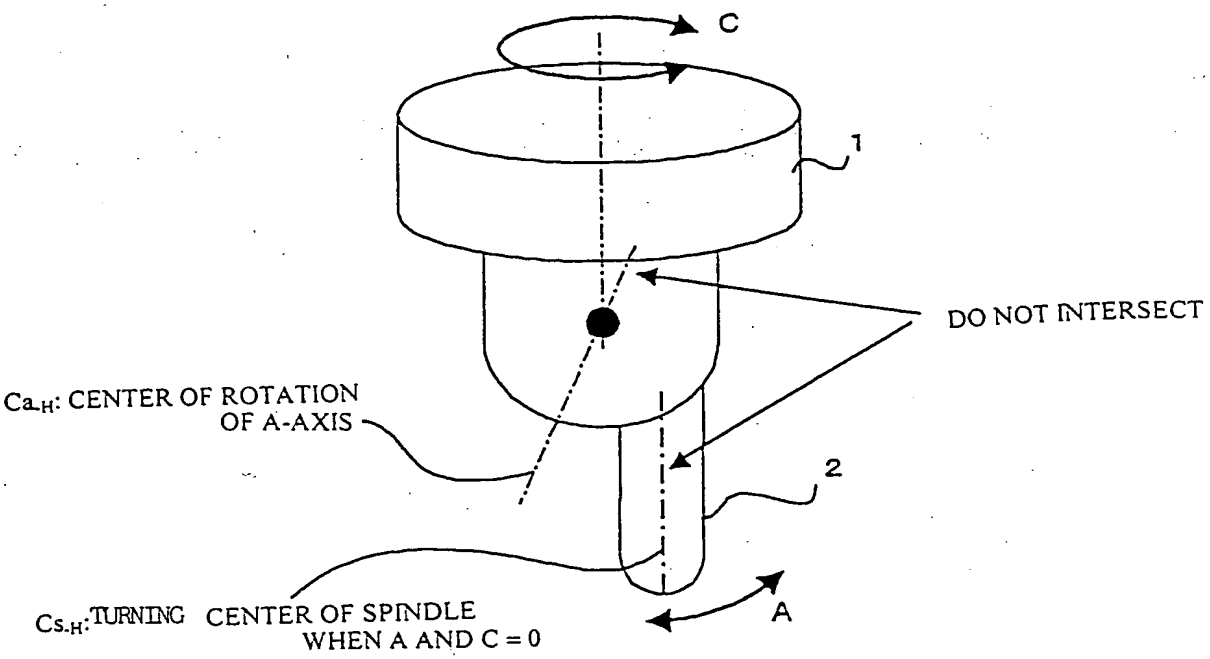

C
1
DO NOT INTERSECT
Ca_H: CENTER OF ROTATION OF A-AXIS
2
Cs_H: TURNING CENTER OF SPINDLE WHEN A AND C = 0
A

FIG. 12

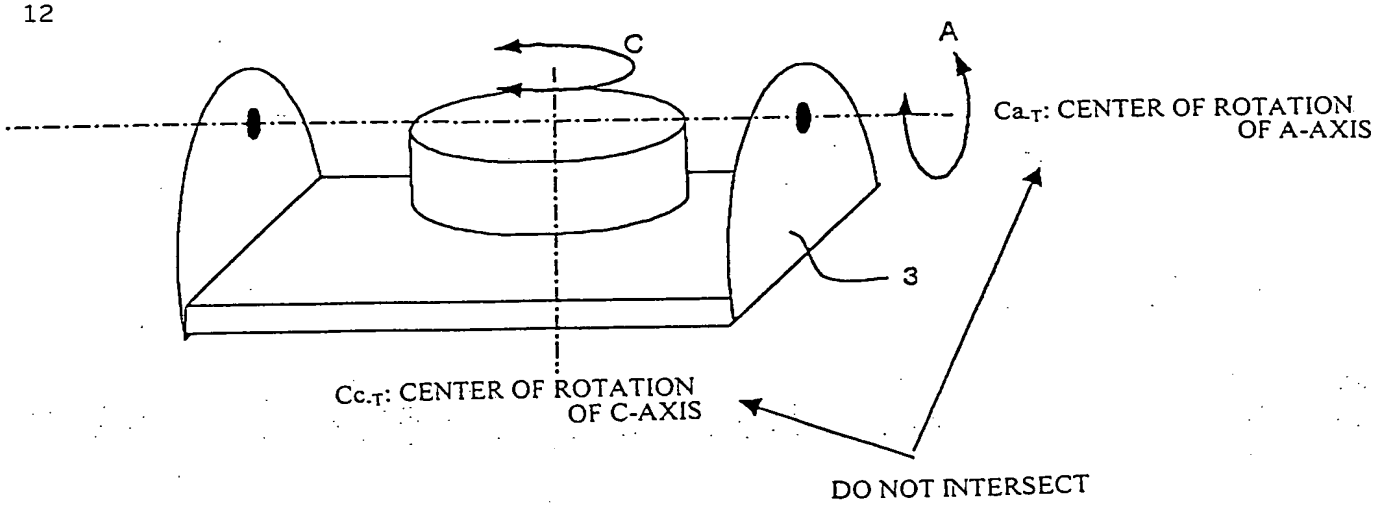
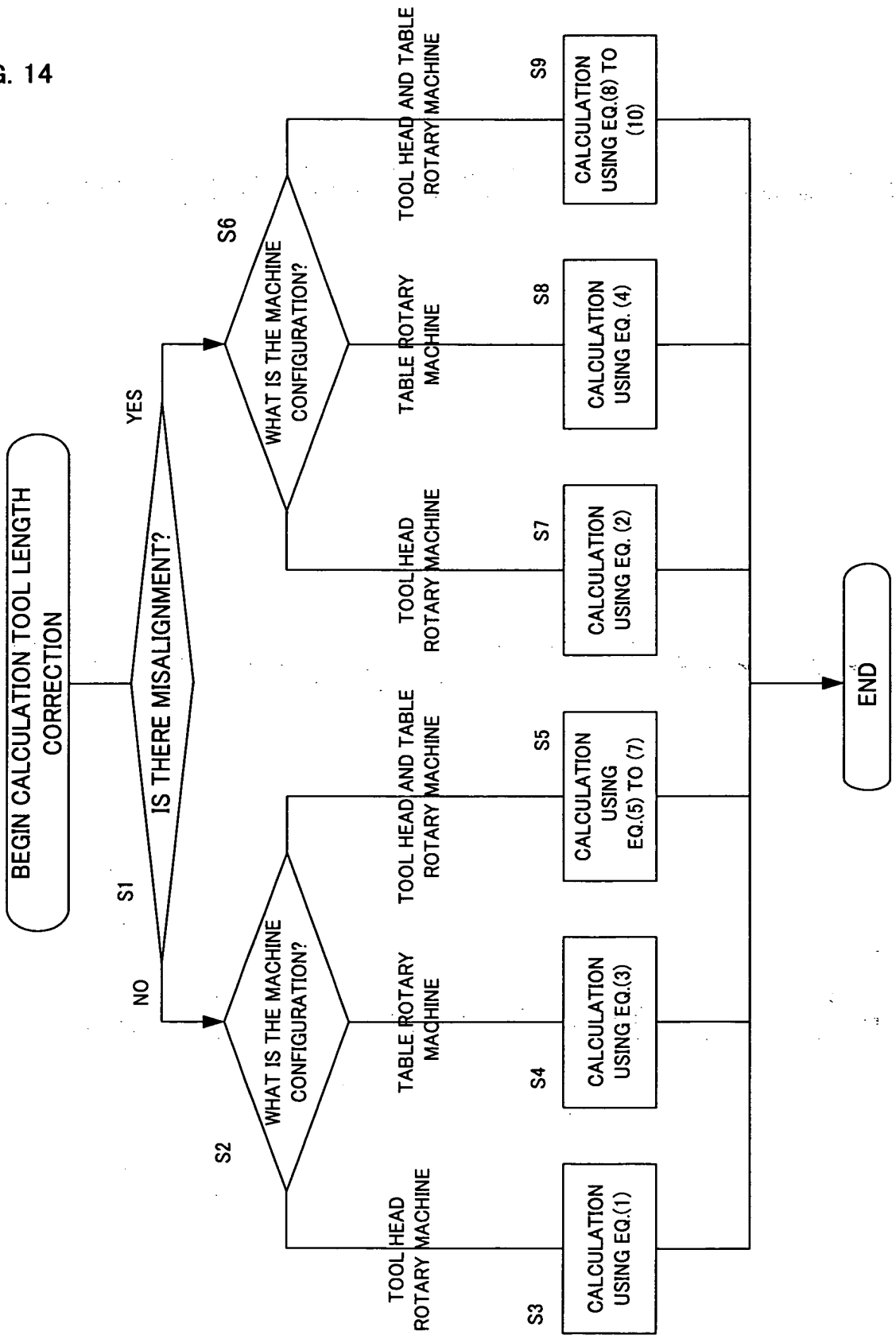

C
A
Ca_T: CENTER OF ROTATION OF A-AXIS
3
Cc_T: CENTER OF ROTATION OF C-AXIS
DO NOT INTERSECT

FIG. 14


BEGIN CALCULATION TOOL LENGTH CORRECTION
S1
IS THERE MISALIGNMENT?
YES
NO
S2
WHAT IS THE MACHINE CONFIGURATION?
TOOL HEAD ROTARY MACHINE
S3
CALCULATION USING EQ.(1)
TABLE ROTARY MACHINE
S4
CALCULATION USING EQ.(3)
TOOL HEAD AND TABLE ROTARY MACHINE
S5
CALCULATION USING EQ.(5) TO (7)
S6
WHAT IS THE MACHINE CONFIGURATION?
TOOL HEAD ROTARY MACHINE
S7
CALCULATION USING EQ. (2)
TABLE ROTARY MACHINE
S8
CALCULATION USING EQ. (4)
TOOL HEAD AND TABLE ROTARY MACHINE
S9
CALCULATION USING EQ.(8) TO (10)
END